ENERGY TECHNOLOGY ENGINEERING CENTER	No. SSWA-AR-0007 Rev. New
OPERATED FOR THE U.S. DEPARTMENT OF ENERGY ROCKETDYNE DIVISION, ROCKWELL INTERNATIONAL	Page 1 of 30 Orig. Date 6/25/96 Rev. Date DRR 25116

TITLE: BUILDING T030 FINAL RADIOLOGICAL SURVEY PLAN

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JUL 17 1996

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Form 735-A-6 Rev 6-91

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1. INTRODUCTION

This document provides the procedures for performing a final radiological survey of Building T030. T030 was used from 1960 through 1964 to house a Van de Graaff accelerator facility for performing activation experiments. Neutrons were produced by the $^{3}H(p,n)^{3}He$ reaction. Activation of the building materials was negligible because drums of borated water were used to shield the target area. A large concrete block wall built as a shield outside the north wall of the facility was not found to be activated. Although the main target radionuclide is tritium, which was used as the target for producing neutrons, the survey procedure will also include general coverage for alpha, beta, and gamma-producing radionuclides.

The scope of this survey includes a 100% direct qualitative scan for alpha, beta-gamma, and tritium contamination followed by an 11% cumulative count survey of interior surfaces of "affected" areas in the western section of the building where the accelerator was original located. The remaining parts of the eastern section of the building are classified as "unaffected" areas and will be surveyed by a 10% qualitative scan, followed by a 2%/5% cumulative count survey. These survey characteristics meet or exceed the DOE guidance for final release surveys (see Reference 3.12).

This survey will ensure that all areas of Building T030 will meet all NRC, DOE and State of California criteria for release of the facility for unrestricted use. The sampling inspection by variables method will be applied to the data obtained in this survey procedure. The in-house computer code "CumPlot" will be used for data analysis and presentation of survey report results.

This is a final survey procedure for a clean facility. Any areas that exceed limits of this procedure will be decontaminated per a separate special procedure and an additional survey performed to document those areas as meeting all DOE, NRC and State of California criteria for release of a facility for unrestricted use.

1.1 Building History

Building T030 was constructed in 1958 for research with a small accelerator neutron source. The building has a total enclosed area of 2,311 ft^2. The facility consists of two connecting sections, both with steel framing, siding and roofs. The rear section (west) was constructed at a right angle to the front office (east) section. Men's and women's restrooms were built into the west section of the building.

A Van de Graaff accelerator was moved into the facility in 1960. The accelerator could provide a proton beam of up to tens of microamperes in current, with continuously adjustable energies from a few hundred keV up to a maximum of at least 1 MeV. The particle beam was well focused, with a diameter of a few millimeters. Neutrons were generated using a tritium

target via the $^3H(p,n)^3He$ reaction. Five gallon cans of borated water were used for neutron shielding around the machine.

The accelerator was operated from 1960 through 1964, at which time the facility was decommissioned. Even though it was not in use, the accelerator remained in the facility after 1964. In 1966, a smear survey of the accelerator (Reference 3.10) showed significant tritium contamination on the accelerator. It was believed that the tritium contamination had not spread to surrounding areas. Following removal of the accelerator in about 1966, the building was surveyed and no residual contamination was found. The building was released for other uses, and has subsequently been used as an office building for purchasing and on-site traffic.

In 1988, a general radiological survey was conducted to clarify and identify areas at the Santa Susana Field Laboratories (SSFL) requiring further radiological inspection or remediation (Reference 3.11). T030 was included in this survey. The scope of the T030 survey included ambient gamma exposure rate measurements, "indication" beta surveys of the accelerator room and outside paved area used for storing palletized containers, and exterior soil samples for tritium content. The results of that survey showed no contamination above release limits in the facility. Tritium analyses on ten soil samples, and the beta survey, showed no detectable activity. Background-corrected gamma measurements were all less than the acceptance limit of 5 μR/hr.

In September 1995, the Oak Ridge Institute for Science and Education (ORISE) conducted a confirmatory survey of several facilities at the SSFL, including T030. The survey included a review of the Rockwell survey data and methodology for T030, and a confirmatory survey for alpha, beta and gamma contamination. With the exception of a single finding for removable tritium contamination of 6,600 dpm/100 cm^2 found on the north wall of the accelerator room, no unusual findings were noted. The 6,600 dpm/100 cm^2 value is, nonetheless, below the release criteria of 10,000 dpm/100cm^2.

Notwithstanding the above findings, ORISE did question the completeness of the 1988 survey. Specifically, ORISE required complete measurements of total or removable surface activity, and additional sampling for tritium activity in the accelerator area. In view of ORISE's finding, it was decided that a complete final survey for T030 should be conducted, which is the subject of the present procedure.

2. SAMPLING PLAN OVERVIEW

The final radiological survey of Building T030 requires a series of specific steps in the sample lots to be surveyed. Distinguishable properties for selecting the sampling lots are rooms in Building T030 where there was known, or suspected, use or presence of radioactive materials. The areas included in the sampling lots are listed below (see Figure 1 for location of rooms in T030):

Sample Lot 1 (Affected Areas): Rooms 101, 102, and restrooms.

Sample Lot 2 (Unaffected Areas): Room 100, and Rooms 104 through 110.

If contamination or high ambient radiation above 25% of release guidelines is found in any areas from Sample Lot 2, those areas will be re-classified as "affected", and surveyed at a 100% level. If necessary, a procedure will be written to decontaminate any rooms with contamination exceeding allowable limits, and document the findings. Any such rooms will be re-surveyed to the limits prescribed in this procedure.

2.1.1 Walls, Floors and Ceiling

For affected areas, direct qualitative scan of 100% of the floor, walls, and ceiling will be conducted using alpha- and beta-sensitive probes. Following the scan, a uniform 3-m x 3-m grid will be laid out on the floor, ceiling and walls, starting in one room at the northwest corner. Based on identification of higher activity areas in the qualitative scan, one 1-m x 1-m area within each 3-m x 3-m grid will be selected for a cumulative count survey. A minimum of 30 data points will be selected in each sample lot. For surfaces having areas less than 1-m x 1-m, a minimum area of 1-m x 1-m will be surveyed by combining the other adjacent remnant areas.

For affected areas, additional surveying will be conducted underneath selected floor tiles in each room or area. The floor tiles in T030 are older type 9-in. x 9-in. tiles which have been shown to contain sufficient levels of asbestos to be classified as Asbestos Containing Material (ACM). Typically, the floor mastic used to attached these tiles is also classified as ACM. The floor tiles will be randomly selected, or chosen from areas where tiles have already been removed or are only loosely adhered to the sub-floor due to years of exposure and moisture leakage. Removal of tiles which remain firmly adhered to the sub-floor will be conducted as needed by trained asbestos abatement personnel. It is probable that areas where the tiles have already been removed, or are only loosely adhered, are areas where potential contamination would be more likely to exist.

For unaffected areas, a direct qualitative scan of 10% of the floors, walls, and ceilings will be conducted. Areas of particular concern should include floor baseboards, window sills, areas behind file cabinets or other furniture, door thresholds, and any other areas where contamination would be likely to have accumulated over time. Following the surface scan, a uniform 3-m x 3-

m grid will be laid out on the floors, wall, and ceilings, as described above. If no activity is found in the qualitative scan, randomly select one 1-m x 1-m grid floor and wall grid within every two 3-m x 3-m grids (approximately 5%), and one 1-m x 1-m ceiling grid within every five 3-m x 3-m (approximately 2%), for cumulative count survey. A minimum of one data point for every 50 m^2 will be obtained.

2.1.2 Structural Surfaces

Structural surfaces consist of beams, pipes, conduits, and other surfaces that are not amenable to large surface measurements. Twenty percent of the structural surfaces will be surveyed for affected areas, and 10% for unaffected areas. The selection of surfaces to survey should be biased toward those expected to have the highest contamination levels (e.g. ledges, tops of conduit, etc.).

2.1.3 Concrete Pads

Concrete pads will be surveyed as a floor area in the same manner as indicated in Section 2.1.1.

2.1.4 Sink Traps

Sink traps located in the affected areas will be sampled for potential contamination. This sampling will include a 100% scan on the outside of the trap (including gamma radiation), a smear survey inside the trap, and if possible, gamma spectroscopy analysis of the disassembled trap.

2.1.5 Roofs

Heating and air conditioning systems for T030 are located at the sides of the building. Return air ducts in both affected and unaffected areas of T030 will be surveyed for possible contamination. If no contamination is found, the remainder of the system will be deemed clean. If contamination is found, this procedure will be red-lined indicating additional survey steps required. If contamination is found above release limits, the registers will be decontaminated and resurveyed per Section 1.

2.2 Instrument Calibrations and Checks

Measurements of the average and maximum alpha surface activities will be made with alpha scintillation detectors, sensitive only to alpha particles with energies exceeding about 1.5 MeV. The detectors will be calibrated with a Th-230 alpha source standard. Measurements of the average and maximum beta surface activities will be made with a thin-window pancake Geiger-Mueller tube. The detectors will be calibrated with a Tc-99 beta source standard.

All portable survey instruments will be serviced and calibrated on a quarterly basis. Daily checks and calibrations will be performed on all instrumentation (when used) to determine

acceptable performance. Daily checks and calibration data will be entered on the appropriate Instrument Qualification Sheet (IQS). Reference 3.1 provides additional methods and procedures for daily qualification.

2.3 General Survey Procedures

Qualitative scans will use a countrate meter with an audible indication. The quantitative measurements will use a scaler readout. For scanning, the detector should be moved slowly (scan rate of less than 5 cm/sec) over the surface being surveyed. The face of the detector should be nearly in contact with the surface, and not more than 1/2-inch away.

Measurements of removable surface alpha and beta activity will be made by wiping approximately 100 cm^2 of surface area using standard smear disks (NPO, cloth, 1¾-inch diameter). The activity on the disks will be measured using a low background gas-flow proportional counter. The counters will be calibrated using Th-230 and Tc-99 standard sources.

All alpha, beta, and gamma survey data will be recorded on Final Survey Data Sheets (FSDSs - see Appendix A).

The ambient exposure rate at 1-meter from surfaces will be measured using a 1-in. NaI scintillation detector. These instruments will be calibrated quarterly and daily checks will be made using a Cs-137 source. The conversion factor to be used is 215 cpm per μR/hr, based on comparisons with a Reuter-Stokes High Pressure Ion Chamber (HPIC).

Measurements of removable tritium activity will be made by wiping approximately 100 cm^2 of surface area using moistened polyfoam smear discs. After the smear is made, the smear disc will be sealed in a liquid scintillator counter (LSC) vial. Loaded vials will be sent to an outside laboratory for analysis by scintillation counting.

3. REFERENCES

3.1 Rockethdyne Document N0010P000033, "Methods and Procedures for Radiological Monitoring"

3.2 Rocketdyne Form 732-A, Rev. 1-91, "Radiation Survey Report"

3.3 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"

3.4 Rocketdyne Document N001OP000032, "Training Program for Radiation Protection and Health Physics Personnel"

3.5 Rocketdyne Document ER-AN-0005, "Training Plan for Environmental Restoration of Radioactively Contaminated Facilities", original dated September 17, 1991

3.6 Rocketdyne RSOP, Environment Health and Safety Procedures

3.7 Rocketdyne Document N001SRR140127, "Proposed Sitewide Release Criteria for Remediation of Facilities at the SSFL"

3.8 Rocketdyne Master Emergency Plan

3.9 "Application of DOE 5400.5 Requirements for Release and Control of Property Containing Residual Radioactive Material", DOE Memorandum, DOE-OAK, January 5, 1996.

3.10 Atomics International Internal Letter dated March 29, 1966, "Tritium Smear Survey, Building 030 Van de Graaff Accelerator", A. R. Mooers to W. F. Heine.

3.11 Rockwell Document 154SRR000001, "Radiological Survey Plan for SSFL", September 25, 1985.

3.12 "Manual for Conducting Radiological Surveys in Support of License Termination", Draft Nuclear Regulatory Commission Report, NUREG/CR-5849, 1992.

4. SPECIAL EQUIPMENT/MATERIALS

4.1 Equipment

4.1.1 Ludlum Model 2220/1-ESG Scaler/Ratemeter

4.1.2 Tennelec Alpha/Beta Counting System

4.1.3 Ludlum Model 44-9 Thin-Window Pancake GM Probe

4.1.4 Ludlum Model 44-2 High-Energy Gamma Probe

4.1.5 Canberra Series 100 MCA System with High-Purity Germanium Detector

4.1.6 Ludlum Model 44-3 Alpha Scintillation Probe

4.1.7 Ludlum Model 12 Countrate Meter

NOTE: "Or equivalent" applies to all above model numbers.

4.2 Materials

4.2.1 NPO 1¾-inch cloth smear discs, or equivalent

4.2.2 Miscellaneous nonhazardous operating supplies

4.2.3 Polyfoam tritium smear discs in LSC vials

NOTE: Review the list of hazardous (restricted) materials in Reference 3.6, EC 04.00.

4.3 Special Instrumentation Instructions

Record the equipment number, serial number, date of use, calibration date, and this procedure number on all radiation survey reports (Reference 3.2) and any other survey information documentation.

5. GENERAL REQUIREMENTS

5.1 Safety Precautions Special Instructions

No special safety hazards to personnel and/or equipment should be present at the time of this survey.

5.1.1 General Health and Safety Instructions

The following general instructions will be observed by all personnel:

a) After each workday, the facility will be closed and locked.

b) All equipment and/or materials removed from the areas called out in this document will be secured at the end of each workday.

c) Protective Services will provide first aid support when required.

d) The Site Emergency Plan (Reference 3.8) is established and will be implemented as required.

5.2 Limits

5.2.1 Surface Contamination Limits for Alpha and Beta-Gamma Emitters

Allowable Total Residual Surface Contamination ($dpm/100cm^2$)[1]

Radionuclides	Average	Maximum	Removable
Sr-90 (separated or enriched), Th-natural, Th-232	<1,000	<3,000	<200
U-natural, U-235, U-238, and associated decay products	<5,000 α	<15,000 α	<1,000 α
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission), including Sr-90 as mixed fission product	<5,000 β-γ	<15,000 β-γ	<1,000 β-γ
Tritium	-	-	10,000 β

[1] From DOE Order 5400.5, Figure IV-1

As used in the table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation. Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently. Beta-gamma emitters include mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object. The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactivity per 100 cm^2 of surface area should be determined by wiping an area of that size with dry filter, soft absorbent paper, or similar smear material, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are below the limits for removable contamination.

Tritium contamination limits are based on interim guidelines for removable surface contamination (Reference 3.9). This level of removable contamination insures that any non-removable or volumetric contamination will not cause unacceptable exposures. Smear methods for tritium detection are similar to that described above, with the exception that a moistened polyfoam disc should be used, followed by storage in an LSC vial. If the property has been recently decontaminated, a follow-up measurement (smears) should be conducted to ensure that there is no build-up of contamination with time.

5.2.2 Ambient Gamma Exposure Rate Limits

Ambient exposure rate at 1-m $\leq$ 5 µR/hr above background.

5.3 Prerequisites

5.3.1 A single designated "working copy" of this final survey procedure will be utilized at the work site. Should changes become necessary, the working copy of this Survey Procedure (SP) will be redlined and approved at a minimum by the PIC, the Operations Manager, and Environmental Remediation (ER); the program manager must approve and sign any changes affecting cost or schedule. At the completion of the task covered by this SP, the Survey Procedure, with all redline changes incorporated and signed, and the required Appendices, will be filed with ER in the T030 project file in building T100.

The designated "working copy" of this SP will be identified as such on the cover page and will be located in an area designated for working copies.

NOTE: General training for ER personnel is conducted per Reference 3.4 and kept in Building T100 and outlined in Appendix B. Site specific training (facility familiarization and this procedure, etc.) must be verified by the PIC.

PIC: __________

5.3.2 Verify that all of the technicians working to these survey procedures have received training courses designated in Appendix B and in Reference 3.5.

PIC: __________

5.3.3 The PIC will verify that each employee working in the area has read and signed the working copy of this document to indicate understanding of the job and instructions.

PIC: __________

5.3.4 All personnel that will initial redlines for sign-offs will sign the initial verification sheet in Appendix C.

____

5.3.5 The ER and the PIC will verify daily that all daily calibrations and checks are made at the beginning of the work day, at mid-day, and at the end of the work day. The average of the backgrounds and efficiency factors determined will be used with data obtained during that day. All calibration and check data will be recorded on an Instrument Qualification Sheet (IQS). Acceptance limits for daily checks will be established for each instrument at ± 20% about the initial calibration value.

ER: __________

PIC: __________

5.3.6 The PIC will arrange and coordinate the transfer of any equipment or personnel present in the sample lot which will effect the survey as determined by ER.

PIC: __________

5.4 Sequence of Activities

5.4.1 Radiological survey of the various sample lots can be accomplished in any order. If appropriate instrumentation is available, the alpha and beta surveys within each sample lot may be performed together.

____

5.4.2 Within each sample lot, the steps in this procedure must be performed in sequence.

____

6. DETAILED SAMPLING PROCEDURE

PIC will verify that this procedure is the latest revision and give permission to proceed:

PIC:__________

Date_________ Time _________

6.1 Sample Lot Survey Procedure (Sample Lot 1 - Affected Areas)

6.1.1 Sample Lot Gridding

Starting in one room or bay in the northwest corner (if possible), layout a uniform 3-m x 3-m grid on the floor, ceiling and walls. One 1-m x 1-m area within each 3-m x 3-m grid, or 30 data points, whichever is larger, will be selected for quantitative survey. For small rooms, a minimum of one sample will be taken from each of the wall, floor, and ceiling areas. If a structural surface is being surveyed, select a 2-ft section out of every 10 ft for sampling. For surfaces having areas less than 1-m x 1-m, a minimum area of 1-m x 1-m will be surveyed by combining the other remnant areas. Complete the gridding for the remainder of the sample lot.

NOTE: Structural surfaces consist of beams, pipes, conduits, and other surfaces that are not amenable to large surface measurements. Twenty percent of the structural surfaces will be surveyed.

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6.1.2 Alpha Average Contamination Measurements

6.1.2.1 Qualitative Scan: With the alpha scintillation probe on a portable countrate (or countrate - scaler) instrument performance checked to Appendix D, uniformly perform a 100% direct scan of each 3-m x 3-m area. Watch and listen for "hot spots" and mark the 1-m x 1-m location where the maximum reading occurs.

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6.1.2.2 Quantitative Scan: With the alpha scintillation probe on a portable countrate (or countrate - scaler) instrument performance checked to Appendix D, select a 3-m x 3-m area and return to the 1-m x 1-m location where the maximum reading occurred or if, none, choose one 1-m x 1-m area. With the instrument set for a 5-min. count time, uniformly scan the selected area. Watch and listen for "hot spots" where radioactivity may exceed the average limit and mark the locations. These are to be resurveyed per Section 6.1.3 as alpha "hot spots".

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6.1.2.3 Record the date, room number, grid location number, and total counts for the 1-m^2 scan on an FSDS.

6.1.2.4 Randomly select four 9-in. x 9-in. floor tile locations in each room for detailed examination. If there are floor tiles already removed, or tiles that are only loosely adhered, select those tiles for the detailed examination. If there are no floor tiles that can be readily removed (or have already been removed), mark four random tiles for removal by asbestos abatement personnel. Repeat steps 6.1.2.1 through 6.1.2.3 for each tile location. Any tiles removed should be double bagged, labeled, and then maintained in the facility pending radiological analysis results of the floor area under the tiles.

6.1.2.5 If contamination is found on the sub-floor under any removed tile, then the tiles from that room or area must be marked as R/A CONTAMINATED.

6.1.3 Alpha Maximum Contamination Measurements

6.1.3.1 Return to any area previously identified as having a "hot spot." Repeat the 5-min. uniform scan of only the "hot spot" area, with the alpha probe, covering 100 cm^2.

6.1.3.2 Record the date, room number, grid location number, and maximum alpha counts for the 100-cm^2 scan on an FSDS.

6.1.4 Beta Average Contamination Measurements

6.1.4.1 Qualitative Scan: With the GM-pancake probe on a portable scaler (or countrate - scaler) instrument performance checked to Appendix E, uniformly perform a 100% direct scan of each 3-m x 3-m area. Watch and listen for "hot spots" and mark the 1-m x 1-m location where the maximum reading occurs.

6.1.4.2 Quantitative Scan: With the GM-pancake probe on a portable scaler (or countrate - scaler) instrument performance checked to Appendix E, select a 3-m x 3-m area and return to the 1-m x 1-m location where the maximum reading occurred or if, none, choose one 1-m x 1-m area. With the instrument set for a 5-min. count time, uniformly scan the selected area. Watch and listen for "hot spots" where radioactivity may exceed the average limit and mark the locations. These are to be resurveyed per Section 6.1.5.

6.1.4.3 Record the date, room number, grid location number, and total counts for the 1-m^2 scan on an FSDS.

6.1.4.4 Repeat steps 6.1.4.1 through 6.1.4.3 for the locations previous chosen in Step 6.1.2.4.

6.1.4.5 If contamination is found on the sub-floor under any removed tile, then the tiles from that room or area must be marked as R/A CONTAMINATED.

6.1.5 Beta Maximum Contamination Measurements

6.1.5.1 Return to any area previously identified as having a "hot spot." Repeat the 5-min. uniform scan of only the "hot spot" area, with the beta probe, covering 100 cm^2.

6.1.5.2 Record the date, room number, grid location number, and maximum beta counts for the 100-cm^2 scan on an FSDS.

6.1.6 Alpha and Beta Removable Contamination Measurements

6.1.6.1 Using an NPO or equivalent 1¾-inch diameter cloth swipe, wipe an "S" or "Z" pattern with legs approximately 6 inches long, so as to sample removable contamination from an area of approximately 100 cm^2 within the 1-m^2 and tile areas identified and measured with the survey meters in the previous steps.

6.1.6.2 Place the smear in an envelope kit and record the room number, grid location, date and time on the envelope. Save all envelopes for the sample lot together.

6.1.7 Sample Lot Repeated Measurement

6.1.7.1 Repeat steps 6.1.2.1 through 6.1.6.2 for each identified 1-m x 1-m area from step 6.1.1 until all measurements for alpha and beta average, maximum and removable contamination have been recorded for the sample lot.

6.1.7.2 When the entire sample lot has been surveyed for removable contamination, count the smears with a Tennelec alpha/beta counter for 1 minute counting and provide analyses results to ER in T100.

6.1.8 Tritium Removable Contamination Measurements

NOTE: For tritium measurements, prepare a moistened polyfoam disc and seal in an LSC vial at the beginning and end of each survey session, and at the beginning, midpoint, and end of each survey day, for background determination.

6.1.8.1 Using a moistened polyfoam disc, wipe an "S" or "Z" pattern with legs approximately 6 inches long, so as to sample removable contamination from an area of approximately 100 cm^2 within the 1-m^2 and tile areas identified and measured with the survey meters in the previous steps.

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6.1.8.2 Place the smear in an LSC vial and seal. Record the room number, grid location, date and time with the number on the vial. Save all vials for the sample lot together, and store in T100 until ready to be shipped to the outside analysis laboratory.

____

6.1.9 Gamma Ambient Exposure Rate Measurements

6.1.9.1 For each selected 1-m x 1-m area of the floor, position a calibrated NaI detector connected to a scaler readout, performance checked to Appendix F, at a distance of 1 meter from the center of the survey area using a 1-m tripod or equivalent holder.

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6.1.9.2 Obtain a 1-min. integrated count at the selected location.

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6.1.9.3 Record the date, room number, grid location number, and total counts for the 1-m^2 scan on an FSDS.

____

6.1.10 Sink Traps

6.1.10.1 With the GM-pancake probe on a portable countrate (or countrate - scaler) instrument performance checked to Appendix E, uniformly perform a 100% direct scan of the sink traps located adjacent to Rooms 101 and 102 . Watch and listen for "hot spots" and mark the location where any maximum reading occurs.

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6.1.10.2 Remove the sink traps, and using an NPO or equivalent 1¾-inch diameter cloth swipe, sample removable alpha/beta contamination from the inside of the traps.

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6.1.10.3 Place the smears in an envelope kit and record the room number, grid location, date and time on the envelope. Save all envelopes for the sample lot together.

6.1.10.4 Using a moistened polyfoam disc, sample removable tritium contamination from the inside of the traps.

6.1.10.5 Place the tritium smear in an LSC vial and seal. Record the room number, grid location, date and time with the number on the vial. Save all vials for the sample lot together, and store in T100 until ready to be shipped to the outside analysis laboratory.

6.1.10.6 Package the trap appropriately and transport to Building T100 for analysis by gamma spectroscopy.

6.1.10.7 Repeat Steps 6.2.10.1 through 6.2.10.5 for the remaining sink traps.

6.1.11 Survey Records

6.1.10.1 Attach one copy of the survey records for the sample lot to this procedure and provide ER with the originals for data analysis.

6.2 Sample Lot Survey Procedure (Sample Lot 2 - Unaffected Areas)

6.2.1 Sample Lot Gridding

Starting in one room or bay locate at one corner (NW corner, if possible), layout a uniform 3-m x 3-m grid on the floor, ceiling and walls. One 1-m x 1-m floor and wall area grid within each two 3-m x 3-m grids, and one 1-m x 1-m ceiling grid within each five 3-m x 3-m grids will be selected for quantitative survey. A minimum of one data point for every 50 m^2 of surface must be taken. For surfaces having areas less than 1-m x 1-m, a minimum area of 1-m x 1-m will be surveyed by combining the other remnant areas. Complete the gridding for the remainder of the sample lot.

NOTE: Structural surfaces will consists of beams, pipes, conduits, and other surfaces that are not amenable to large surface measurements. Ten percent of the structural surfaces will be surveyed.

6.2.2 Alpha Average Contamination Measurements

6.2.2.1 Qualitative Scan: With the alpha scintillation probe on a portable countrate (or countrate - scaler) instrument performance checked to Appendix D, uniformly perform a 10% direct scan of each 3-m x 3-m area. Take additional readings on areas where contamination is likely to have accumulated, such as floor baseboards, windows sills, areas behind file cabinets or other furniture, and door thresholds. Watch and listen for "hot spots" and mark the 1-m x 1-m location where the maximum reading occurs.

____

6.2.2.2 Quantitative Scan: With the alpha scintillation probe on a portable scaler instrument performance checked to Appendix D, select two adjacent 3-m x 3-m floor and wall areas and return to the 1-m x 1-m location where the maximum reading occurred or if, none, choose one 1-m x 1-m area. If the floor and wall area is greater than 50 m^2 then survey a minimum of one 1-m x 1-m area for every 50 m^2. With the instrument set for a 5-min. count time, uniformly scan the selected area. Watch and listen for "hot spots" where radioactivity may exceed the average limit and mark the locations. These are to be resurveyed per Section 6.2.3 as alpha "hot spots".

____

6.2.2.3 Quantitative Scan: With the alpha scintillation probe on a portable scaler instrument performance checked to Appendix D, select five adjacent 3-m x 3-m ceiling areas and return to the 1-m x 1-m location where the maximum reading occurred or if, none, choose one 1-m x 1-m area. If the ceiling area is greater than 50 m^2 then survey a minimum of one 1-m x 1-m area for every 50 m^2. With the instrument set for a 5-min. count time, uniformly scan the selected area. Watch and listen for "hot spots" where radioactivity may exceed the average limit and mark the locations. These are to be resurveyed per Section 6.2.3 as alpha "hot spots".

____

6.2.2.4 Record the date, room number, grid location number, and total counts for the 1-m^2 scan on an FSDS.

____

6.2.3 Alpha Maximum Contamination Measurements

6.2.3.1 Return to any area previously identified as having a "hot spot." Repeat the 5-min. uniform scan of only the "hot spot" area, with the alpha probe, covering 100 cm^2.

____

6.2.3.2 Record the date, room number, grid location number, and maximum alpha counts for the 100-cm^2 scan on an FSDS.

____

6.2.4 Beta Average Contamination Measurements

6.2.4.1 Qualitative Scan: With the GM-pancake probe on a portable countrate (or countrate - scaler) instrument performance checked to Appendix E, uniformly perform a 10% direct scan of each 3-m x 3-m area. Take additional readings on areas where contamination is likely to have accumulated, such as floor baseboards, windows sills, areas behind file cabinets or other furniture, and door thresholds. Watch and listen for "hot spots" and mark the 1-m x 1-m location where the maximum reading occurs.

____

6.2.4.2 Quantitative Scan: With the GM-pancake probe on a portable scaler instrument performance checked to Appendix E, select two adjacent 3-m x 3-m floor and wall areas and return to the 1-m x 1-m location where the maximum reading occurred or if, none, choose one 1-m x 1-m area. If the floor and wall area is greater than 50 m^2 then survey a minimum of one 1-m x 1-m area for every 50 m^2. With the instrument set for a 5-min. count time, uniformly scan the selected area. Watch and listen for "hot spots" where radioactivity may exceed the average limit and mark the locations. These are to be resurveyed per Section 6.2.5 as beta "hot spots".

____

6.2.4.3 Quantitative Scan: With the GM-pancake probe on a portable scaler instrument performance checked to Appendix E, select five adjacent 3-m x 3-m ceiling areas and return to the 1-m x 1-m location where the maximum reading occurred or if, none, choose one 1-m x 1-m area. If the ceiling area is greater than 50 m^2 then survey a minimum of one 1-m x 1-m area for every 50 m^2. With the instrument set for a 5-min. count time, uniformly scan the selected area. Watch and listen for "hot spots" where radioactivity may exceed the average limit and mark the locations. These are to be resurveyed per Section 6.2.5 as beta "hot spots".

____

6.2.4.4 Record the date, room number, grid location number, and total counts for the 1-m^2 scan on an FSDS.

____

6.2.5 Beta Maximum Contamination Measurements

6.2.5.1 Return to any area previously identified as having a "hot spot." Repeat the 5-min. uniform scan of only the "hot spot" area, with the beta probe, covering 100 cm^2.

____

6.2.5.2 Record the date, room number, grid location number, and maximum beta counts for the 100-cm^2 scan on an FSDS.

____

6.2.6 Alpha and Beta Removable Contamination Measurements

6.2.6.1 Using an NPO or equivalent 1¾-inch diameter cloth swipe, wipe an "S" or "Z" pattern with legs approximately 6-inches long, so as to sample removable contamination from an area of approximately 100 cm^2 within the 1-m^2 areas identified and measured with the survey meters in the previous steps.

____

6.2.6.2 Place the smear in an envelope kit and record the room number, grid location, date and time on the envelope. Save all envelopes for the sample lot together.

____

6.2.7 Sample Lot Repeated Measurement

6.2.7.1 Repeat steps 6.2.2.1 through 6.2.6.2 for each identified 1-m x 1-m area from step 6.2.1 until all measurements for alpha and beta average, maximum and removable contamination have been recorded for the sample lot.

____

6.2.7.2 When the entire sample lot has been surveyed for removable contamination, count the smears with a Tennelec alpha/beta counter for 1 minute counting and provide analyses results to ER in T100.

____

6.2.8 Tritium Removable Contamination Measurements

NOTE: For tritium measurements, prepare a moistened polyfoam disc and seal in an LSC vial at the beginning and end of each survey session, and at the beginning, midpoint, and end of each survey day, for background determination.

6.2.8.1 Using a moistened polyfoam disc, wipe an "S" or "Z" pattern with legs approximately 6 inches long, so as to sample removable contamination from an area of approximately 100 cm^2 within the 1-m^2 and tile areas identified and measured with the survey meters in the previous steps.

____

6.2.8.2 Place the smear in an LSC vial and seal. Record the room number, grid location, date and time with the number on the vial. Save all vials for the sample lot together, and store in T100 until ready to be shipped to the outside analysis laboratory.

____

6.2.9 Gamma Ambient Exposure Rate Measurements

6.2.9.1 For each selected 1-m x 1-m area of the floor, position a calibrated NaI detector connected to a scaler readout performance checked to Appendix F, at a distance of 1

meter from the center of the survey area using a 1-m tripod or equivalent holder.

6.2.9.2 Obtain a 1-min. integrated count at the selected location.

6.2.9.3 Record the date, room number, grid location number, and total counts for the 1-m^2 scan on an FSDS.

6.2.10 Survey Records

6.2.10.1 Attach one copy of the survey records for the sample lot to this procedure and provide ER with the originals for data analysis.

7. COMPLETION REVIEW AND APPROVAL

7.1 Procedure complete:

PIC ______________________________ Date ____________

7.2 Procedure reviewed and satisfactory:

Project Engineer ______________________________ Date ____________

Quality Assurance ______________________________ Date ____________

7.3 Procedure acceptable and available for external use:

Environmental Remediation ____________________ Date ____________

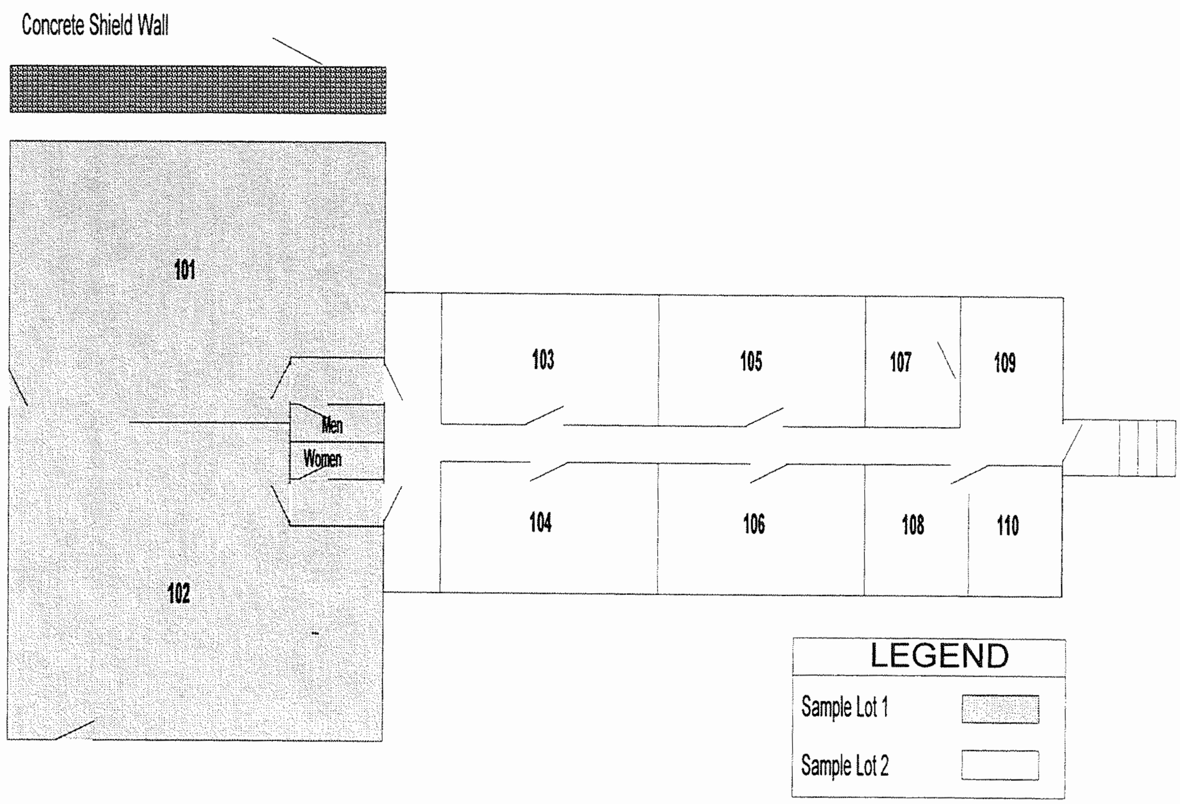

Figure 1. T030 Sample Lot Locations

Appendix A

Final Survey Data Sheet

FINAL SURVEY DATA SHEET

DATE: ____________ PAGE: ________ of ________

BUILDING: ____________ PROCEDURE: ____________

DATA DESCRIPTION: ________________________________

			GROSS COUNTS IN 5 MINUTES								COUNTS IN 1 MIN	
	SAMPLE GRID	GRID	ALPHA				BETA				GAMMA	
	LOCATION	NO.	CS DATE	TOTAL	MAX	REM	CS DATE	TOTAL	MAX	REM	CS DATE	TOTAL
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												

Appendix B

Building T030 Survey Training Requirements

Qualification/Training	Course No.[a]	Facility Mgr.	PIC	Techs.	Rad. Rem.	H&S	Env. Rem.	Others
Medical Surveillance:								
Radiation Dosimetry	-	-	X	X	X	X[b]	X[b]	X[b]
Respirator Qualified	-	-	X	X	-	-	-	-
Training:								
Radworker I Qualified	4013 5078	X	-	-	-	X[c]	X[c]	X[c]
Radworker II Qualified	4013 4071 4072	-	X	X	X	-	-	-
Haz. Mat'l Comm.	4010		X	X	X	X	X	X
Half Mask MSA[e]	1030	-	X	X	-	X	X	-
Full Face Mask[e]	1032	-	X	X	-	X	X	-
Haz. Waste Pkg. & Trans.[e]	4028-1	-	X	X	X	-	-	-
Haz. Waste Handling[e]	4004	-	X	X	X	-	-	-
Fork Lift[d]	2003	-	-	X	-	-	-	X

[a]Course number from Technical Skills & Development Department.
[b]Applies when entry into a radiation area is planned.
[c]Applies when work in radiation area is planned.
[d]Required for operators of equipment only.
[e]As required.

Appendix C

Document Sign-Off Form

Name (signature)	SS#	Date	Verified (PIC)

Appendix D

Alpha Instrument Qualification Data Sheet

RADIATION PROTECTION & HEALTH PHYSICS SERVICES
ALPHA DAILY INSTRUMENT QUALIFICATION REPORT

INSTRUMENT ELECTRONICS		RADIATION DETECTOR	
RI#:	S/N:	RI#:	S/N:
MFR:	Mdl:	MFR:	Mdl:
		Det Eff Fctr: dpm/cpm	

CALIBRATION

Last Calibrated: Next Cal Due:

FIELD CHECK SOURCE

	Isotope	Activity
Source ID:		
Verified By:		

INSTRUMENT QUALIFICATION DATA

	Shift Start:	Mid-Shift:		Shift End:
Check Time:				
SCALER DIAGNOSTIC (CAL)				
( ) BAT:				
( ) HV:				
( ) THRSH:				
BACKGROUND RESPONSE				
5 Min Count:				
:				
CalcAvg cpm:				
5 min Count:				
CHECK-SOURCE RESPONSE				
5-Min Count:				
Expectd Cnt:				
* Calc E/F:				

DAILY AVERAGES

Check Source			Ambient Background		
Avg:	±	cpm	Avg Bkgd:	±	cpm
Norm Avg:	±	dpm	Norm Avg:	±	dpm
Avg E/F:	±	dpm/cpm	Std Norm Avg:	±	dpm/100cm

Completed By: Date: Project:

Appendix E

Beta Instrument Qualification Data Sheet

RADIATION PROTECTION & HEALTH PHYSICS SERVICES
BETA DAILY INSTRUMENT QUALIFICATION REPORT

INSTRUMENT ELECTRONICS	RADIATION DETECTOR
RI#:__________ S/N:__________	RI#:__________ S/N:__________
MFR:__________ Mdl:__________	MFR:__________ Mdl:__________
	Det Eff Fctr:__________ dpm/cpm

CALIBRATION

Last Calibrated:__________ Next Cal Due:__________

FIELD CHECK SOURCE

Source ID:__________ Isotope Activity
Verified By:__________

INSTRUMENT QUALIFICATION DATA

	@Shift Start:	@Mid-Shift:		@Shift End:
Check Time:				
SCALER DIAGNOSTIC (CAL)				
( ) BAT:				
( ) HV:				
( )THRSH:				
BACKGROUND RESPONSE				
5-Min Count:				
:				
CalcAvg cpm:				
5 min Count:				
CHECK-SOURCE RESPONSE				
5-Min Count:				
Expectd Cnt:				
* Calc E/F:				

DAILY AVERAGES

Check Source		Ambient Background	
Avg:__________ ± __________	cpm	Avg Bkgd:__________ ± __________	cpm
Norm Avg:__________ ± __________	dpm	Norm Avg:__________ ± __________	dpm
Avg E/F:__________ ± __________	dpm/cpm	Std Norm Avg:__________ ± __________	dpm/100cm

Completed By: Date: Project:

Appendix F

Gamma Instrument Qualification Data Sheet

RADIATION PROTECTION & HEALTH PHYSICS SERVICES
GAMMA DAILY INSTRUMENT QUALIFICATION REPORT

INSTRUMENT ELECTRONICS	RADIATION DETECTOR
RI#: ________ S/N: ________	RI#: ________ S/N: ________
MFR: ________ Mdl: ________	MFR: ________ Mdl: ________
	Det Norm Fctr: ________

CALIBRATION

Last Calibrated: ________ Next Cal Due: ________

FIELD CHECK SOURCE

Source ID: ________ Isotope Activity
Verified By: ________

INSTRUMENT QUALIFICATION DATA

	@Shift Start:	@Mid-Shift:		@Shift End:
Check Time:				
SCALER DIAGNOSTIC (CAL)				
( ) BAT:				
( ) HV:				
( ) THRSH:				
BACKGROUND RESPONSE				
5-Min Count:				
:				
CalcAvg cpm:				
5 min Count:				
CHECK-SOURCE RESPONSE				
5-Min Count:				
Expectd Cnt:				
* Calc E/F:				

DAILY AVERAGES

Check Source		Ambient Background	
Avg: ____ ± ____	cpm	Avg Bkg: ____ ± ____	cpm
Avg E/F: ____ ± ____	dpm	Norm Avg: ____ ± ____	cpm
		Avg Bkg: ____ ± ____ Exp.	uR Hr

Completed By: Date: Project: